

CLAIMS

1. Stack consisting of a filter-press modular arrangement comprising a multiplicity of single proton exchange membrane fuel cells and of cooling devices, each cell being delimited by a pair of metal bipolar plates and comprising ion-exchange membranes and perimetrical sealing gaskets shaped as frames suitable for housing current collectors within their hollow central part, the bipolar plates and the gaskets being provided with passage openings comprising holes for feeding the reactant gases, for extracting the residual gases with the reaction products, for injecting and discharging a thermostatting fluid, characterised in that the lateral migration of ions proceeding from said thermostatting fluid inside said ion-exchange membranes is prevented.
2. The stack of claim 1 characterised in that the bipolar plate closest to the negative terminal is free of passage openings.
3. The stack of claim 1 characterised in that said lateral migration of ions is prevented by means of a physical isolation of the ion-exchange membranes from the thermostatting fluid.
4. The stack of any one of claims 1 to 3 characterised in that the construction material of the metal bipolar plates is stainless steel containing 16-26% chromium, 10-22% nickel, and optionally molybdenum.
5. The stack of claim 4 characterised in that said stainless steel is selected between AISI 316L and the steels of the CrNi 2520 series according to DIN.
6. The stack of any one of the previous claims characterised in that the thermostatting fluid is demineralised water circulating in a close circuit.
7. The stack of any one of the previous claims characterised in that the perimeter of the ion-exchange membranes is located in an intermediate region of the perimetrical sealing gaskets comprised between the edge of the central hollow portion and the circumference of the passage openings.
8. The stack of claim 7 characterised in that the ion-exchange membranes are isolated from the thermostatting fluid by means of sealing elements located in said intermediate region, optionally comprising ridges or rings.

9. The stack of any one of the previous claims characterised in that the ion-exchange membranes are provided with passage holes matching the passage openings of the gaskets and having a greater section than said openings, which are isolated from the thermostatting fluid by means of sealing elements located between the edges of said passage holes of the membranes and the passage openings of the gaskets optionally comprising ridges or rings of non conductive material in form of planar gaskets or O-rings.

10. The stack of claim 9 characterised in that said rings of non conductive material are made of low hardness rubbers, optionally EPM or EPDM.

11. The stack of claim 9 characterised in that said rings of non conductive material consist of a liquid film applied at the moment of assembling the stack and polymerised with a catalyst contained in the liquid film, or by UV irradiation or thermal treatment.

12. The stack of claim 11 characterised in that said film is provided with elasticity and reduced hardness after polymerisation.

13. The stack of any one of claims 11 or 12 characterised in that said liquid film consists of a silicon resin-based polymerisable material.

14. Stack substantially as described with reference to the appended figures.